Physical Review Letters 1996 vol.77 N16, pages 3459-3462

High-frequency electron paramagnetic resonance of Tm3+ ions in lanthanum and thulium ethylsulphate single crystals

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Abstract

We have observed electron paramagnetic resonance and far-infrared absorption of the transitions between the singlet ground state and the first excited doublet of the Van Vleck paramagnetic Tm3+ ion in ethylsulphate crystals in fields up to 10.5 T. The interaction of the Stark levels with a phonon state is clearly shown. The EPR of Tm3+ in the 1000-1600 GHz range are single Lorentzians in lanthanum ethylsulphate but are asymmetric and richly structured in thulium ethylsulphate. This work illustrates the usefulness of high-frequency EPR in the study of Van Vleck paramagnets, which are inaccessible by EPR at conventional frequencies.